

# BUREAU OF WATER

South Carolina Department of Health and Environmental Control

## SHELLFISH MANAGEMENT AREA 10A

---

### 2003 ANNUAL UPDATE

#### **Shellfish Sanitation Program**

Water Monitoring, Assessment and Protection Division  
Environmental Quality Control - Bureau of Water  
2600 Bull Street  
Columbia, South Carolina 29201

**July 2003**



**WEB ADDRESS:**  
<http://www.scdhec.net/water/html/shellfish.html#reports>

# **2003 ANNUAL UPDATE**

**[ Data Thru December 2002 ]**

## **Shellfish Management Area 10A Shellfish Sanitation Program**



**Preparers:** Benjamin S. Whaley, Environmental Health Manager  
Harry M. Seel, Jr., District Program Manager  
Trident Environmental Quality Control District  
1362 McMillan Avenue, Suite 300  
Charleston, South Carolina 29405

**Reviewers/Editors:**  
David G. Baize, Division Director  
(and) Charles Newell, Shellfish Program Manager  
Water Monitoring, Assessment, and Protection Division  
Environmental Quality Control - Bureau of Water  
2600 Bull Street  
Columbia, South Carolina 29201

*David G. Baize, Division Director*  
Water Monitoring, Assessment, and Protection Division  
Environmental Quality Control - Bureau of Water

## TABLE OF CONTENTS

### Shellfish Management Area 10A Annual Update

Summary .....	2
Introduction .....	2
Pollution Source Survey.....	6
Changes In Pollution Sources .....	6
Survey Procedures .....	6
Point Source Pollution.....	6
A. Municipal and Community Waste Treatment Facilities .....	6
B. Industrial Waste .....	7
C. Marinas .....	7
D. Radionuclides .....	7
Nonpoint Source Pollution.....	7
A. Urban and Suburban Stormwater Runoff .....	7
B. Agricultural Runoff.....	8
C. Individual Sewage Treatment and Disposal Systems .....	8
D. Wildlife and Domestic Animals .....	8
E. Boat Traffic .....	8
F. Hydrographic and Habitat Modification .....	9
G. Marine Biotoxins .....	9
Hydrographic and Meteorological Characteristics .....	9
Water Quality Studies   10	
Conclusions .....	11
Recommendations .....	11
References .....	13

### Figures and Tables

#### Figures:

(1) Shellfish Harvesting Classification Prior to this Survey .....	15
(2) Current Shellfish Harvesting Classification .....	16
(3) Potential Pollution Sources.....	17

#### Tables:

(1) Shellfish Water Quality Sampling Stations Description .....	14
(2) Fecal Coliform Bacteriological Data Summary Sheet (January 01, 2000 - December 31, 2002) .....	18
(3) Water Quality Sampling Station Data .....	19
(4) Rainfall Data (January 01, 2000 - December 31, 2002) .....	20

**ANNUAL UPDATE**  
**Shellfish Management Area 10A**  
**SCDHEC EQC Bureau of Water**

**Data Inclusive Dates:**

01 / 01 / 00 thru 12 / 31 / 02

**Classification Change:**

  X   Yes         No

**Shoreline Survey Completed:**   Yes  

**(I)ncreased/(D)ecreased/(N)one:**

  D      Approved

  N      Cond. Approved

  I      Restricted

  N      Prohibited

**Prior Report & Date:** Annual -2002

**SUMMARY**

Shellfish growing area water quality within portions of Area 10A continues to fluctuate. Statistically, water quality typically oscillates between Approved and Restricted criteria. For the January 2000 through December 2002 review period, 18 of the 27 classified stations exhibited a slight decrease in fecal coliform concentrations from those of the previous three-year review period. Nearly all of The Area 10A upland shoreline has residential development bordering the marsh. Impervious surfaces typically result in increased volumes of stormwater runoff. Impervious surfaces may also result in a more rapid movement of stormwater into adjacent shellfish harvesting waters. These factors increase the potential for water quality to be adversely impacted within the immediate area. There was a 30% increase in total rainfall for 2002 as compared with the 2001 total. Increases in rainfall typically result in increased stormwater runoff, which often results in elevated fecal coliform levels. This is evident in the area of Station 11, which will be downgraded to Restricted from an Approved classification.

**INTRODUCTION**

**PURPOSE AND SCOPE**

The authority to regulate the harvest, sanitation, processing and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47, which provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The National Shellfish Sanitation Program (NSSP) Guide For The Control Of Molluscan Shellfish is used by the United States Food and Drug Administration (USFDA) to evaluate state shellfish

sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each growing area prior to its use as a source of shellfish for human consumption and prior to the area's classification as Approved, Conditionally Approved, Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirement of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and S.C. Regulation 61-47 are used in establishing shellfish harvesting classifications:

**Approved** - Growing areas shall be classified Approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations which would render shellfish unsafe for human consumption. The Approved area classification shall be designated based upon a sanitary survey, which includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, and not more than ten percent of the samples shall exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform Most Probable Number (MPN) shall not exceed fourteen per one hundred milliliters, and the estimated ninetieth percentile shall not exceed an MPN of forty three (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP Guidelines.

**Conditionally Approved** - Growing areas may be classified Conditionally Approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as Conditionally Approved. Where appropriate, the management plan for each Conditionally Approved area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems, evaluation of each source of pollution, and means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate.

**Restricted** - Growing areas shall be classified Restricted when sanitary survey data show a limited degree of pollution or the presence of deleterious or poisonous substances to a degree which may cause the water quality to fluctuate unpredictably or at such a frequency that a Conditionally Approved classification is not feasible. Shellfish may be harvested from areas classified as Restricted

only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. For Restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

**Conditionally Restricted** - Growing areas may be classified Conditionally Restricted when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as Conditionally Restricted. Where appropriate, the management plan for each Conditionally Restricted area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems and an evaluation of each source of pollution) and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as Conditionally Restricted only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision. For Conditionally Restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of Conditionally Restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

**Prohibited** - Growing areas are classified Prohibited if there is no current sanitary survey or if the sanitary survey or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or indicate that such substances could potentially reach quantities which could render shellfish unfit or unsafe for human consumption.

## **BACKGROUND INFORMATION**

This sanitary survey evaluates the current harvesting classification of shellfish growing waters designated as Shellfish Management Area 10A. Area 10A consists of approximately 15,191 acres of shellfish growing area habitat located in Charleston County, South Carolina. Area 10A extends in a

northeasterly to southwesterly direction from the Charleston Harbor to the Stono River. The major water bodies in Area 10A include Folly River, Lighthouse Creek, Schooner Creek and Clark Sound. The area is bordered to the northeast by the geographic boundaries of Clark Sound and Parrot Point Creek. An imaginary line from the confluence of the Folly River and the Stono River, northeastward through King Flats, to a point adjacent to Fludds Creek, at the northwest corner of Clark Sound, defines the area's western boundary. The southern and eastern boundary consists of the Atlantic Ocean shoreline of Folly and Morris Islands respectively.

The harvesting classifications of Area 10A prior to this sanitary survey were as follows:

**Prohibited: (Administrative closure)**

1. Those waters and adjacent marshland between Schooner Creek and the Charleston Harbor;
2. Those waters and adjacent marshland from Station 32 to the southern end of Morris Island;
3. Those waters within 1000 feet of Backman's Commercial Fisheries Dock and Folly Marina;
4. Those waters within 1,210 feet of Mariner's Cay Marina;
5. Those waters within 350 feet of Crosby's Commercial Fisheries Dock.

**Restricted:**

1. Those waters of Clark Sound and adjacent marshlands in its entirety;
2. Those waters along the western bank of Schooner Creek and adjacent marshlands from Clark Sound to the Administratively Prohibited closure at Station 18;
3. Those waters north of an imaginary line extending from Station 33 to Station 34.

**Approved:** All other waters in Area 10A.

The shellfish industry in South Carolina is based primarily on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams, which include both the northern clam (*Mercenaria mercenaria*) and several small populations of the southern clam (*Mercenaria campechiensis*). Areas in South Carolina designated for commercial harvest by the South Carolina Department of Natural Resources (SCDNR) include State shellfish grounds, culture permits, and Kings Grant areas. The ribbed mussel (*Geukensia demissa*) is also harvested in South Carolina. *Geukensia sp.* harvest is an extremely small-scale recreational fishery. The South Carolina Department of Health and Environmental Control disallows the harvesting of shellfish for direct marketing purposes from Restricted waters. Shellfish harvesting from Prohibited waters for human consumption is not allowed.

There are seven State Shellfish Grounds (S) within Area 10A. S205 falls partially within the Prohibited waters of Schooner Bay and the Restricted waters of Clark Sound. S206 occupies a large portion of the Area 10A Approved area. S203 falls in the Restricted waters of Clark Sound and the Prohibited waters of Schooner Bay and Charleston Harbor. S196 is designated as "recreational use

only”, as is S201, a small ground located on the southern bank of the Folly River at the town of Folly Beach. S200 occupies a narrow band that separates S196 from the lower Folly River. S200 was placed under a precautionary closure in October 2002 due to oil fouling. Subsequent tissue analysis for Polycyclic Aromatic Hydrocarbons (PAHs) indicated concentrations that were consistent with oysters from areas typically unaffected by oil spills. One additional state shellfish ground, S189, extends only slightly into the southern portion of Area 10A from Area 11. There are two Recreational Shellfish Grounds (R) located in Area 10A. Both of these areas are located in the Folly River adjacent to the Folly Road Bridge. Numerous shellfish culture (CP) and mariculture permit (MP) areas are located throughout Area 10A.

The shellfish harvest season in South Carolina normally extends from September 16 through May 14. The SCDNR has the authority to alter the shellfish harvesting season for resource management purposes and grant permits for year-round mariculture operations. Additionally, the South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that shellfish harvested in South Carolina waters are safe for human consumption.

## **POLLUTION SOURCE SURVEY**

### **CHANGES IN POLLUTION SOURCES**

No substantial changes in pollution sources have occurred in Area 10A since the 2002 report.

### **SURVEY PROCEDURES**

Shoreline surveys of Area 10A were conducted by the Trident District Shellfish Sanitation staff, by watercraft, vehicle and on foot, during the survey period and are ongoing. Extensive visual examinations of lands adjacent to the waters of Area 10A were conducted to determine potential sources of pollution entering shellfish growing waters.

### **POINT SOURCE POLLUTION**

- A. Municipal and Community Waste Treatment Facilities** - There are no permitted wastewater facilities within Area 10A. Nearly all of Area 10A is served by the James Island Public Service District. The Plum Island Wastewater Treatment Plant (SC0021229), operated by the Charleston Commissioners of Public Works, receives wastewater from James Island; however, Plum Island is located on the Ashley River adjacent to Wappoo Creek, and discharges treated wastewater into the Charleston Harbor (Area 10B).

Available hydrographic information suggests a possible impact from sources located outside the growing area. The portion of the area from the Charleston Harbor extending southwest to Schooner Creek appears to be adversely impacted during certain hydrographic conditions by

waters originating in the Charleston Harbor (Moore, 1984). Outfalls from wastewater treatment plants discharging into the harbor are subsequently discharging into northeastern portions of Area 10A. Flow calculations have established time and distance of travel and place the effluent plumes within Schooner Bay near Fort Sumter. Due to public health concerns, waters from the confluence of Schooner Creek and Schooner Bay and all associated creeks and marshland to the Charleston Harbor will remain administratively Prohibited.

- B. Industrial Waste (Discharges)** - Atlantic Farms, Inc. is the only permitted industrial discharge within Area 10A. Atlantic has been issued a NPDES general permit SCG130001 for aquaculture discharges. General permit SCG130001 discharges to the Folly River, which is adjacent to the facility. This discharge is depicted on the attached Potential Pollution Source map.
- C. Marinas** – S.C. Regulation 61-47, Shellfish defines *Marina* as “any water area with a structure (docks, basin, floating docks, etc.) which is: 1) used for docking or otherwise mooring vessels; and, 2) constructed to provide temporary or permanent docking space for more than ten boats, or has more than 200 linear feet of docking space.” There are two recreational marinas located within this management area. The first, Mariner's Cay Marina, is located on the Folly River adjacent to Folly Road. The second, Folly Marina, is located on the Folly River approximately one mile southwest of Mariner's Cay. Both facilities offer wastewater pump-out to marina occupants. There are two commercial facilities meeting the definition a marina within Area 10A. Backman's Seafood operates a dock located in a creek north of Bowen's Island off of Folly Creek. Crosby's Fish and Shrimp Company operates a dock located in Folly Creek adjacent to Folly Road. All marinas within Area 10A have adequate closure zones.
- D. Radionuclides** - Sources of radionuclides have not been identified within Area 10A, and radionuclide monitoring has not been conducted. No other sources of poisonous or deleterious substances have been identified within the area.

## NONPOINT SOURCE POLLUTION

- A. Urban and Suburban Stormwater Runoff** - The shoreline survey conducted in Area 10A revealed a high concentration of homes throughout most uplands adjacent to the shellfish growing area. Single-family homes continue to be built sporadically along the mainland shores. Areas around Folly Creek and Oak Island continue to be the areas within Area 10A where heavy development is occurring. Runoff from these three locations has the potential to affect culture and mariculture lease area 207 and State grounds in the Folly River. Stormwater runoff impacts water quality by transporting fecal coliform bacteria from land to the shellfish growing area.

Stormwater permits may be used as an indicator of land disturbing activities. There are approximately nine stormwater permits that have been issued within Area 10A. The permits are distributed throughout the area and have been primarily issued to construction sites and/or

housing subdivisions. The remaining permits are for stormwater control for schools, churches and commercial properties. These areas are depicted on the attached Potential Pollution Source map.

The Army Corps of Engineers did not conduct any dredge projects in Area 10A during this survey period. The Folly River entrance requires maintenance dredging on a regular basis. The dredge material is either placed on the ocean side of the southern most portion of Folly Island for beach renourishment or placed in an offshore spoil site.

Morris Island is the only dredge spoil area within Area 10A and it has not been used since 1994. The Army Corps of Engineers reserve the right to use the spoil area at any time. The State Ports Authority (SPA) conducts maintenance dredging adjacent to their terminals (Area 10B). The Drum Island spoil area is the primary site used by the SPA in the Cooper River. Drum Island is reaching its capacity and will soon be permanently closed. The SPA will then use Morris Island more frequently.

The uplands surrounding the shellfish growing waters of Area 10A consist of various soil textures. These have been defined by the United States Department of Agriculture (USDA), Soil Conservation Service (1971) utilizing general classifications and descriptions. Although lands within Area 10A consist of numerous soil types, the area is generally comprised of Wando-Seabrook soils, and occur on flat ridges and lower lying bands. The USDA (1971) further describes these soils as "moderately well drained to excessively drained, nearly level to gently sloping, sandy soils."

- B. Agricultural Runoff** - There are no permitted agricultural facilities located in Area 10A. The lack of concentrated agricultural activity near the shoreline of the growing waters precludes contamination of shellfish waters from agricultural runoff.
- C. Individual Sewage Treatment and Disposal Systems** - Homes adjacent to shellfish growing waters on James Island and Folly Island are primarily served by sanitary sewer, although some homes in the outlying areas, primarily in the northern end of Folly Island, are serviced by individual septic systems. Each system requires inspection by the Division of Environmental Health, Trident Health District, and approval before final installation.
- D. Wildlife and Domestic Animals** - Area 10A supports a large population of domestic animals attributable to the numerous private residences along the shores of both James Island and Folly Island. The area supports a moderate amount of wildlife; primarily various types of waterfowl and marine mammals. These marine birds and mammals have been seen in large concentrations along Bird Key in the Folly River. The entire growing area has an extensive network of small tidal creeks. This creek system provides a possible conduit for animal fecal coliform bacteria to be transported to the adjacent growing waters.
- E. Boat Traffic** - Recreational boat traffic is moderate in the area throughout the year.

Commercial fisheries boats, ranging in size from 16 to 50 feet, operate throughout the area. There are heavy mariculture interests within this area. Folly River and Folly Creek are used on nearly a daily basis by these permit holders. During the recreational shrimp- baiting season, typically extending from mid-September through mid-November, recreational traffic is heavy.

- F. Hydrographic and Habitat Modification** - Hydrographic and habitat modification in estuarine areas requires both State and Federal approval. Portions of Folly River require maintenance dredging. The U.S. Army Corps of Engineers utilize a designated tract of land adjacent to Lighthouse Creek on Morris Island as a dredge spoil site.
- G. Marine Biotoxins** - Bivalve shellfish contamination from marine biotoxins has not been shown to be a human health concern within Area 10A. The Shellfish Sanitation Section has developed a Biotoxin Contingency Plan in response to a *Gymnodinium breve* (formally *P. brevis*) bloom that occurred during the 1997-1998 shellfish harvest season. The Department also participates in an interagency Toxic Algae Workgroup and directs a toxic algae emergency response team.

## HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

### PHYSIOGRAPHY

Area 10A consists of the waters of the Folly River system and the Clark Sound basin. Connections with the Atlantic Ocean are via the Charleston Harbor, Lighthouse Inlet and Stono Inlet. Influence of high salinity ocean water entering the area by way of these inlets provide high flow and a subsequent flushing action which assists in maintaining high water quality. The creeks within the area range from 30 to 500 feet in width and average 3 to 25 feet in depth. The entire area is approximately four miles wide (northwest to southeast) and eleven miles long (southwest to northeast).

**Tides** - Tides in Area 10A are semidiurnal, consisting of two low and two high tides occurring each lunar day. Mean tidal ranges in Folly Creek, at the Folly Road Bridge, are 5.5 feet during normal tides and 7.1 feet during spring tides. Wind direction and intensity, as well as atmospheric pressure, typically cause variations in predicted tidal ranges.

**Rainfall** - Precipitation in Area 10A is heaviest during late summer and early autumn. Tropical storms and hurricanes occasionally produce extremely large amounts of rainfall. During winter months heavy rainfall events are uncommon, yet occasional intense thunderstorms associated with rapidly moving low-pressure systems generate heavy rains. Precipitation rarely occurs in the form of snow or ice. Spring weather patterns may be dynamic with associated thunderstorms and severe weather conditions.

The yearly rainfall average for a thirty-year period in Charleston, recorded at the Charleston Airport, is 50.74 inches. The 2002 precipitation total recorded at Plum Island on James Island was 57.0 inches. The months of July through October had a total of 20.45 inches of rain, representing 36%

of the total rainfall recorded for the year.

**Winds** - Prevailing winds along the central portion of the South Carolina coast are from the south and west during spring and summer and from the north during autumn and winter. Wind speeds are generally less than 15 miles per hour (mph); however, strong weather systems may generate winds in excess of 25 mph. Tropical storms and hurricanes occur occasionally.

**River Discharges** - Freshwater rivers do not discharge directly into Area 10A. Freshwater influence is primarily due to rainfall.

## **WATER QUALITY STUDIES**

### **DESCRIPTION OF THE PROGRAM**

The Department currently utilizes a systematic random sampling (SRS) strategy within Area 10A in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty samples are required to be collected and analyzed from each station during the review period. Sampling dates are computer generated prior to the beginning of each quarterly period thereby insuring random selection with respect to tidal stage and weather. Day of week selection criteria is limited to Mondays, Tuesdays and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered.

During July 1998, an updated shellfish water quality data scheduling and collection procedure was formalized. Samples utilized for classification purposes are limited to those samples collected in accordance with the SRS for a 36-month period beginning January 1 and ending December 31. This allows for a maximum of 36 samples per station, yet provides a six-sample "cushion" (above the NSSP required 30 minimum) for broken sample bottles, lab error, breakdowns, etc. This also allows each annual report's water quality data to meet the requirements for the NSSP Triennial Review sampling criteria.

Nine hundred and sixty-nine SRS surface water quality samples (<1.0 ft. deep) were collected for bacteriological analyses and classification purposes from twenty-seven active water quality sampling stations in Area 10A during the period 01/01/00 through 12/31/02. Samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported to the South Carolina Department of Health and Environmental Control's Trident District Environmental Quality Control laboratory at North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment as a temperature control. At the laboratory, sample sets exceeding a 30-hour holding time or containing a temperature control in excess of 10 degrees C. were discarded (APHA, 1970).

Surface water temperatures were measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements were measured in the laboratory using an automatic temperature compensated refractometer. Additional field data include ambient air temperature, wind direction, tidal stage and date and time of sampling. Tidal stages were determined by using Nautical

Software's *Tides & Currents*, Version 2 (1996).

## **MONITORING RESULTS**

No station exceeded a fecal coliform geometric mean MPN value of 14. No station exceeded a fecal coliform geometric mean MPN value of 88. Stations exceeding a fecal coliform MPN estimated 90th percentile value of 43 were 11, 16, 16A and 35. No station exceeded an estimated 90th percentile fecal coliform MPN value of 260.

## **CONCLUSIONS**

Based on a review of the fecal coliform bacteriological data and the pollution source survey, Area 10A is primarily impacted by one source of actual or potential pollution.

## **NONPOINT SOURCE RUNOFF**

Stormwater runoff continues to be the major source of fecal coliform bacteria throughout the area. The moderate populations of domestic and wild animals likely impact water quality in the area. Overland runoff in Area 10A appears to be mitigated by ocean water flushing through Lighthouse and Stono Inlets.

The water quality at Station 11 is continually fluctuating between the Restricted and Approved status. The statistical water quality data indicates a downturn for this three-year review period, which will result in a Restricted classification. Lighthouse Point, the upland area adjacent to Station 11, is currently served by individual sewage treatment disposal systems (ISTDS). This area will likely continue to fluctuate between Approved and Restricted based upon the amount of rainfall the area receives. In 2002 it received 30% more rainfall than it did the previous year. Stations 30 and 31 are also likely to be impacted by runoff from Lighthouse Point, as Station 30 is directly adjacent to an area still served by ISTDS and Station 31 is directly upstream of station 11.

## **RECOMMENDATIONS**

The shoreline survey and bacteriological data review of shellfish growing Area 10A indicate that the classification boundary descriptions should be modified. The harvesting classification of Area 10A for this sanitary survey will be as follows:

### **Prohibited: (Administrative closure)**

1. Those waters and adjacent marshland between Schooner Creek and the Charleston Harbor;
2. Those waters and adjacent marshland from Station 32 to the southern end of Morris Island;

3. Those waters within 1000 feet of Backman's Commercial Fisheries Dock and Folly Marina;
4. Those waters within 1,210 feet of Mariner's Cay Marina;
5. Those waters within 350 feet of Crosbs Commercial Fisheries Dock.

**Restricted:**

1. Those waters of Clark Sound and adjacent marshlands in its entirety;
2. Those waters along the western bank of Schooner Creek and adjacent marshlands from Clark Sound to the Administratively Prohibited closure at station 18;
3. Those waters north of an imaginary line extending from station 33 to station 34;
4. Those waters of Rat Island Creek from its confluence of Lighthouse Creek to Station 30;
5. Those waters northeast of an imaginary line extending from Station 30 to Station 31 in Rat Island Creek;
6. Those waters south of an imaginary line extending from Station 31 to the confluence of Lighthouse and Rat Island Creeks.

**Approved:** All other waters in Area 10A.

**Station Additions/Deactivations/Modifications :** None

Analysis of sampling data for Area 10A demonstrates the probability of a significant impact from rainfall exceeding 4.00" in a 24 hour period. Therefore, a precautionary closure of Area 10A will be implemented following rainfall events of greater than 4.00" in a 24 hour period, as measured at the Charleston Commissioners of Public Works, Plum Island Wastewater Treatment Plant located on James Island. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP). PMP estimates for the coastal United States have been published in a series of hydro-meteorological reports (HMRs) by the National Weather Service (*National Weather Service*). PMP estimates for South Carolina's growing areas are derived from HMRs 51, 52, and 53 (*National Research Council, 1985*).

## REFERENCES

- American Public Health Association, Inc. *Procedures for the bacteriologic examination of sea water and shellfish*, 1970. p. 28-47. In *Recommended procedures for the examination of sea water and shellfish*, 4th ed. Library of Congress, Washington, D.C.
- National Research Council, 1985, "*Safety of Dams - Flood and Earthquake Criteria*" National Academy Press, Washington DC.
- National Shellfish Sanitation Program (NSSP)-- *Guide for the Control of Molluscan Shellfish*, 1997 Revision. U.S. Department of Health and Human Services, Washington, D.C.
- National Weather Service. The National Oceanic and Atmospheric Administration. *Precipitation Frequency Atlas of the Western US: NOAA Atlas II*. Superintendent of Documents, US Government Printing Office - Washington DC.
- United States Department of Agriculture, Soil Conservation Service, 1971. *Soil survey of Charleston County, South Carolina*. In cooperation with South Carolina Agricultural Experiment Station and South Carolina Land Resources Conservation Commission, National Cooperative Soil Survey, Washington, D.C. p. 78.
- Moore, E., 1984. *Clark Sound: Water Quality Assessment of a Shellfish Growing Area*. South Carolina Department of Health and Environmental Control, Shellfish and Recreational Waters Division.

**TABLE #1**  
**Shellfish Management Area 10A**  
**Water Quality Sampling Stations Description**

<b><u>Station</u></b>	<b><u>Description</u></b>
02	Folly Creek Bridge
03	Bowen Island Dock in Folly Creek
04	Backman Creek at Folly Creek
05	King Flats and Folly Creek
06	Opposite Little Island in Folly Creek
07	North boundary of Prohibited Area at Folly Marina
08	Folly River Bridge
09	Last dock north in Folly River
11	Rat Island Creek at confluence with first creek on left from Lighthouse Creek
13	Lighthouse Creek at confluence with Folly Creek
15	Secessionville Creek at private docks
15A	Folly Creek at confluence with Secessionville Creek
16	Clark Sound at Ocean View Flats
16A	Fludds Creek at Clark Sound
18	Mouth of Schooner Creek
19	Just inside Clark Sound from Schooner Creek
22	Folly River State Shellfish Ground opposite Folly Island
23	Lighthouse Creek State Shellfish Ground at mouth of First Sister Creek
24	Cole Creek State Shellfish Ground
26	Lighthouse Creek just seaward of confluence with Folly River
28	Mouth of small creek leading to back of Block Island
30	Second bend in Rat Island Creek
31	Upper reaches of Rat Island Creek NW of station 11
32	Block Island Creek - 100 yds S.of split from spoil area
33	Confluence of Lighthouse Creek and Clark Sound
34	The first Dock in Secessionville Creek at its confluence with Clark Sound
35	Right Fork of Schooner Creek, middle of Docks, across from Parrot Point

Figure 1.  
Shellfish Management  
Area 10A  
Prior Classification

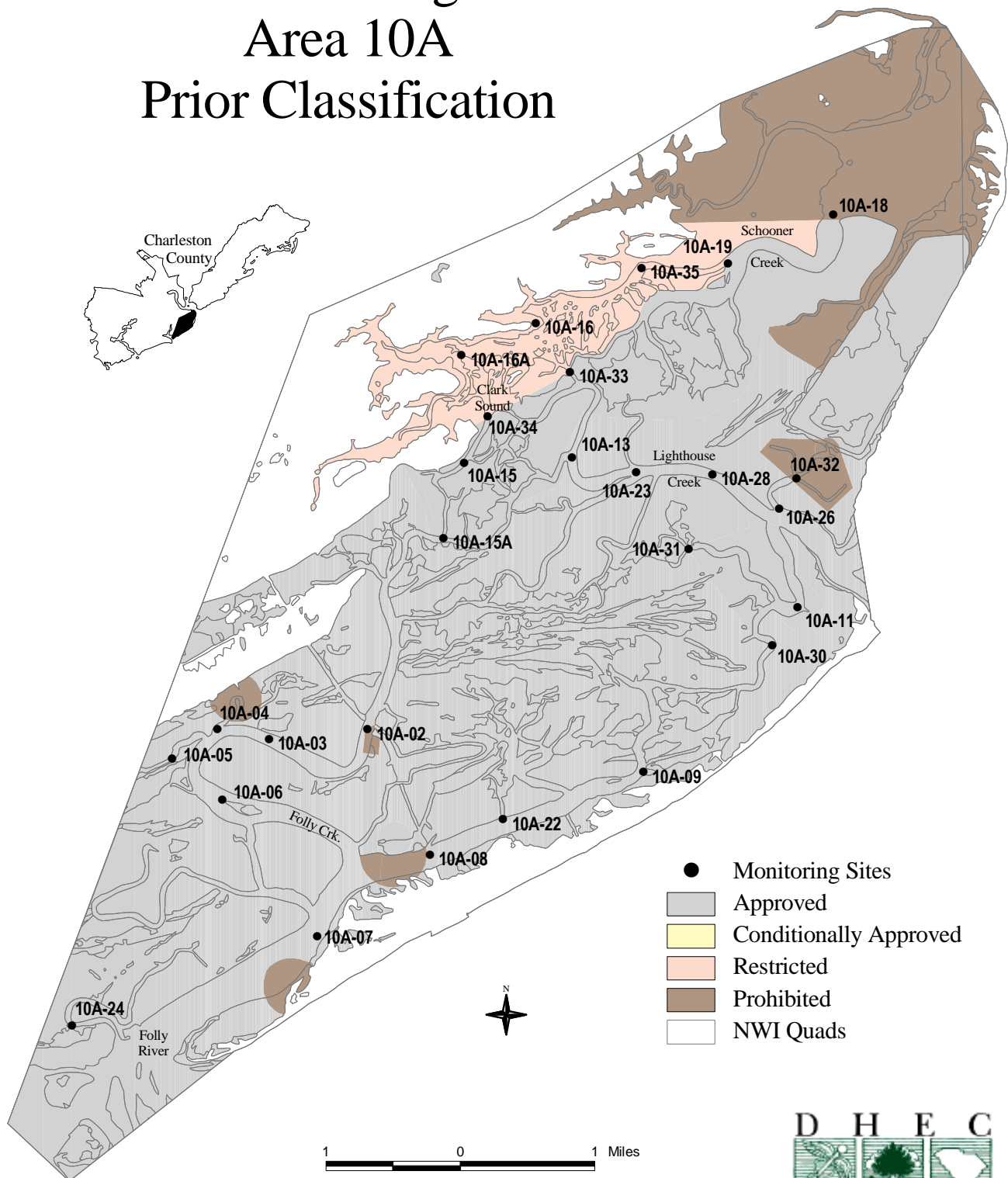


Figure 2.  
Shellfish Management  
Area 10A  
Current Classification

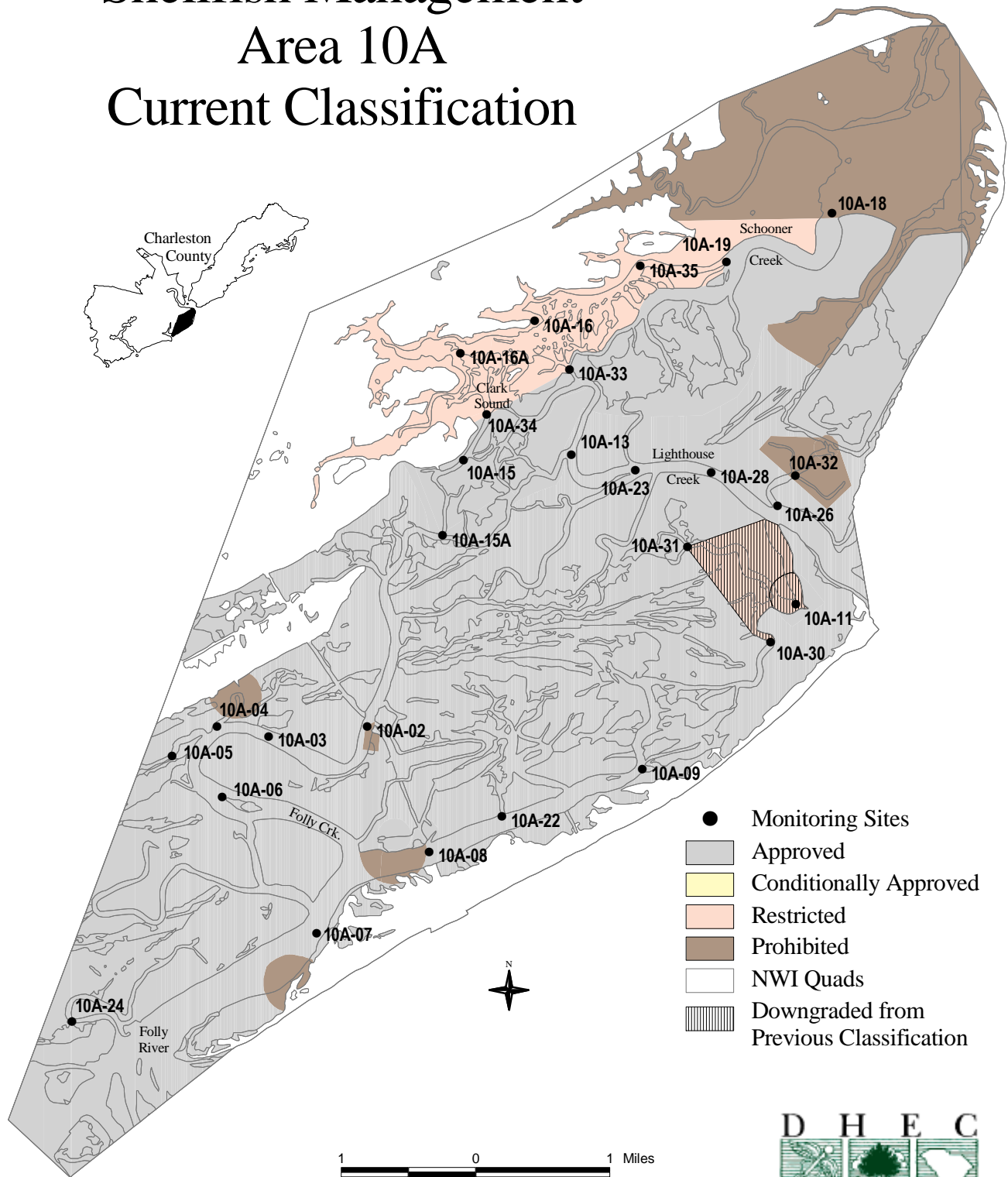
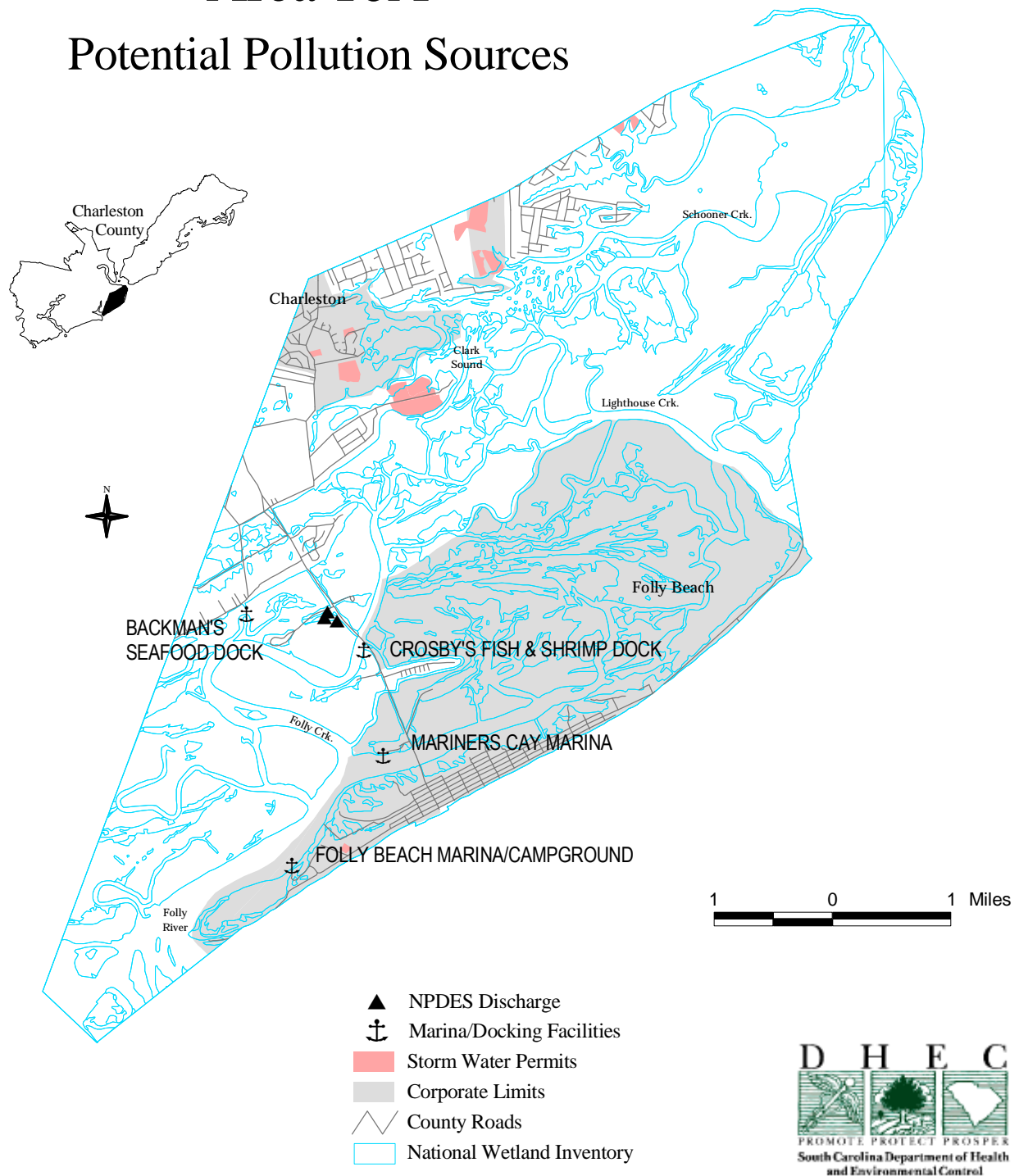


Figure 3.  
**Shellfish Management  
 Area 10A**  
**Potential Pollution Sources**



**TABLE #2**  
**Shellfish Management Area 10A**

***FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY***  
***from Shellfish Water Quality Sampling Stations between***

**January 1, 2000 and December 31, 2002**

Station #	2	3	4	5	6	7	8	9	11	13
SAMPLES	35	36	36	36	36	36	36	36	36	35
GEOMEAN	4.1	4.0	4.7	4.0	3.2	5.0	4.7	6.0	6.8	3.5
90TH %ILE	12	12	17	12	10	31	20	26	47	10
WATER QLTY	A	A	A	A	A	A	A	A	R	A
CLASSIFICATION	P	A	A	A	A	P	P	A	R	A

Station #	15	15A	16	16A	18	19	22	23	24	26
SAMPLES	36	36	36	36	36	36	36	36	36	36
GEOMEAN	5.0	3.3	8.9	13.0	3.2	4.4	4.9	2.9	3.4	4.7
90TH %ILE	19	9	52	99	9	15	18	8	10	18
WATER QLTY	A	A	R	R	A	A	A	A	A	A
CLASSIFICATION	A	A	R	R	P	R	A	A	A	A

Station #	28	30	31	32	33	34	35			
SAMPLES	35	36	36	36	36	36	36			
GEOMEAN	3.6	6.6	3.0	5.7	3.8	6.2	6.9			
90TH %ILE	11	30	10	27	10	33	50			
WATER QLTY	A	A	A	A	A	A	R			
CLASSIFICATION	A	R	R	P	R	R	R			

**A** - Approved      **CA** - Conditionally Approved      **R** - Restricted  
**RND** - Restricted/No Depuration      **P** - Prohibited

**TABLE #3**

## **Water Quality Sampling Stations Data**

**Shellfish Management Area 10A**

## **BACTERIOLOGICAL DATA**

Data for each shellfish station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports, can be obtained through South Carolina's Department of Health and Environmental Control - Freedom of Information office at the address below.

Freedom of Information  
2600 Bull Street  
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

**TABLE #4**

## **Rainfall Data**

---

**Shellfish Management Area 10A**

# ANNUAL TABLE OF DAILY RAINFALL DATA

*SOURCE: Charleston Commissioner of Public Works  
Plum Island Wastewater Treatment Plant (James Island, SC)*

2000	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00
3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.20
4th	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
5th	0.20	0.00	0.00	0.00	0.00	0.25	0.00	0.35	0.90	0.00	0.00	0.00
6th	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	1.20	0.00	0.00	0.00
7th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9th	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.15	0.10	0.00	0.00	0.00
10th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70
11th	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12th	0.00	0.00	0.30	0.00	0.00	0.00	0.20	0.60	0.00	0.00	0.00	0.05
13th	0.00	0.00	0.00	0.00	0.00	0.00	1.60	3.00	0.00	0.00	0.00	0.00
14th	0.00	0.70	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00
15th	0.00	1.40	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
16th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
17th	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10
18th	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	2.00	0.00	0.20	0.00
19th	0.20	0.00	0.00	0.00	0.00	0.20	0.00	0.10	0.60	0.00	0.30	0.00
20th	0.20	0.00	0.20	0.00	0.00	0.30	0.00	0.20	0.00	0.00	1.20	0.00
21st	0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00
22nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23rd	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.40	0.00	0.00	0.00
24th	0.30	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00
25th	1.30	0.00	0.00	0.10	0.00	0.00	0.80	0.00	0.00	0.00	0.40	0.00
26th	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.90	0.00
27th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28th	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00
29th	0.10		0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	1.20
30th	0.50		0.00	0.20	0.00	1.50	1.20	0.90	0.00	0.00	0.00	0.00
31st	0.30		0.20		0.00		0.20	0.00		0.00		0.00

(Monthly Figures)

Year's Rainfall Total:

38.33

TOTAL	3.50	2.10	4.10	1.20	0.00	2.25	6.25	5.95	7.43	0.00	3.10	2.45
MAX	1.30	1.40	1.40	0.40	0.00	1.50	1.60	3.00	2.00	0.00	1.20	1.20
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.11	0.08	0.13	0.04	0.00	0.08	0.20	0.19	0.25	0.00	0.10	0.08

Note: "--" denotes missing data

(Shellfish Management Areas 10A, 10B, and 11)

# ANNUAL TABLE OF DAILY RAINFALL DATA

*SOURCE: Charleston Commissioner of Public Works  
Plum Island Wastewater Treatment Plant (James Island, SC)*

2001	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2nd	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00
3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	2.50	0.00	0.00	0.00
4th	0.00	0.00	0.30	0.00	0.00	0.20	0.20	0.00	0.80	0.00	0.00	0.00
5th	0.00	0.20	0.20	0.00	0.00	0.00	0.40	0.00	0.30	0.00	0.00	0.00
6th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	0.00	0.00
7th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.20	0.00	0.00
8th	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10	0.00	0.00	0.00
9th	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00
10th	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00
11th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.10
12th	0.05	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13th	0.40	0.60	1.10	0.00	0.00	0.40	0.20	0.00	0.00	0.00	0.00	0.10
14th	0.00	0.00	0.00	0.10	0.00	0.00	0.00	3.40	0.00	0.00	0.00	0.10
15th	0.00	0.00	0.20	0.00	0.00	0.10	0.00	0.10	0.00	0.30	0.00	0.20
16th	0.00	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
19th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00
20th	0.10	0.00	0.40	0.00	0.00	0.30	0.00	0.20	0.00	0.00	0.00	0.00
21st	0.10	0.00	3.80	0.00	0.00	0.20	0.40	1.00	0.00	0.00	0.00	0.00
22nd	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.30	0.00	0.00	0.00
23rd	0.20	0.70	0.00	0.00	0.60	0.10	1.00	0.00	0.00	0.00	0.00	0.00
24th	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00	0.00	0.00	0.20	0.00
25th	0.00	0.00	0.20	0.00	0.00	0.50	0.00	0.00	0.20	0.00	0.30	0.00
26th	0.00	0.10	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27th	0.00	0.00	0.00	0.00	0.80	0.00	1.10	0.00	0.00	0.00	0.00	0.00
28th	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00	0.00	0.00
29th	0.00		0.00	0.00	0.80	0.00	0.50	0.00	0.00	0.00	0.00	0.00
30th	0.00		0.20		0.30	0.00	0.70	0.00	0.00	0.00	0.00	0.00
31st	0.00		0.00		0.00		0.00	0.00		0.00		0.00

(Monthly Figures)

Year's Rainfall Total:

39.85

TOTAL	1.25	1.90	7.80	0.30	2.50	2.30	8.50	7.10	4.50	0.50	0.60	2.60
MAX	0.40	0.70	3.80	0.20	0.80	0.50	1.80	3.40	2.50	0.30	0.30	2.10
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.04	0.07	0.25	0.01	0.08	0.08	0.27	0.23	0.15	0.02	0.02	0.08

Note: "--" denotes missing data

(Shellfish Management Areas 10A, 10B, and 11)

# ANNUAL TABLE OF DAILY RAINFALL DATA

*SOURCE: Charleston Commissioner of Public Works  
Plum Island Wastewater Treatment Plant (James Island, SC)*

2002	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.00	0.00	0.00
3rd	0.30	0.00	2.50	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00
4th	0.00	0.00	0.50	0.00	0.40	0.00	0.00	0.00	0.10	0.00	0.30	0.00
5th	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	1.00	0.40
6th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
7th	0.60	1.30	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.50	0.00	0.00
8th	0.00	0.60	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.40	0.00	0.00
9th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.40
10th	0.00	0.70	0.10	0.20	0.00	0.00	0.20	0.00	0.00	1.10	1.20	0.70
11th	0.00	0.20	0.00	1.50	0.00	0.00	0.00	0.00	0.00	1.30	1.00	0.00
12th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.60
13th	1.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.60
14th	0.00	0.00	0.00	0.00	0.60	0.00	0.30	0.00	0.40	0.50	0.00	0.00
15th	0.50	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.40	0.00	0.00
16th	0.00	0.20	0.00	0.00	0.00	0.00	1.20	0.00	1.30	0.00	1.20	0.00
17th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00
18th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
19th	0.00	0.00	0.00	0.00	0.80	0.90	0.00	0.40	0.00	0.00	0.00	0.40
20th	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
21st	0.00	0.50	0.00	0.00	0.00	1.90	0.00	0.00	0.00	0.30	0.00	0.00
22nd	0.00	0.00	1.80	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00
23rd	0.00	0.00	0.00	0.00	0.00	1.50	0.50	0.00	0.00	0.00	0.00	0.00
24th	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.10	0.00	0.00	1.60
25th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	1.50	0.00	0.00	0.00
26th	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.80	0.00	0.00	0.00
27th	0.00	0.00	0.40	0.00	0.00	0.00	0.10	0.40	0.00	0.00	0.00	0.10
28th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.40	0.00	0.00
29th	0.00		0.00	0.00	0.00	0.00	0.00	1.10	0.00	0.00	0.00	0.00
30th	0.00		0.00	0.00	0.00	0.00	0.00	1.40	0.00	0.00	0.00	0.00
31st	0.00		0.00		0.00		0.00	1.00		0.00		0.80

(Monthly Figures)

Year's Rainfall Total:

57.00

TOTAL	2.80	3.50	5.90	2.60	2.00	6.20	2.80	6.90	5.15	5.60	7.55	6.00
MAX	1.00	1.30	2.50	1.50	0.80	1.90	1.20	1.40	1.50	1.30	2.00	1.60
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.09	0.13	0.19	0.09	0.06	0.21	0.09	0.22	0.17	0.18	0.25	0.19

Note: "--" denotes missing data

(Shellfish Management Areas 10A, 10B, and 11)